

PUBLIC HEALTH ACT,
(11 & 12 Vict., Cap. 63.)

R E P O R T

TO THE

GENERAL BOARD OF HEALTH,

ON A

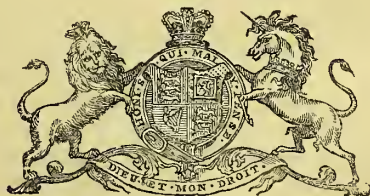
PRELIMINARY INQUIRY

**INTO THE SEWERAGE, DRAINAGE, AND SUPPLY OF
WATER, AND THE SANITARY CONDITION
OF THE INHABITANTS**

OF THE TOWN OF

P E N Z A N C E.

By GEORGE THOMAS CLARK,
SUPERINTENDING INSPECTOR.



LONDON:

**PRINTED BY W. CLOWES & SONS, STAMFORD STREET.
FOR HER MAJESTY'S STATIONERY OFFICE.**

1849.

NOTIFICATION.

THE General Board of Health hereby give notice, in terms of section 9th of the Public Health Act, that on or before the 17th May, written statements may be forwarded to the Board with respect to any matter contained in or omitted from the accompanying Report on the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Borough of PENZANCE, or with respect to any amendment to be proposed therein.

By order of the Board,

HENRY AUSTIN, *Secretary.*

14th April, 1849.

PUBLIC HEALTH ACT (11 and 12 Vict., cap. 63.)

Report to the General Board of Health on a Preliminary Inquiry into the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Town of PENZANCE.
By GEO. T. CLARK, Superintending Inspector.

London, 20th February, 1849.

MY LORDS AND GENTLEMEN,

IN accordance with your instructions, and in pursuance of public notice given as directed under the Public Health Act, I have inspected the municipal borough of Penzance, in Cornwall, and have been engaged there from the 10th to the 13th instant inclusive, making and recording the inquiries directed in my instructions, and in the above Act.

2. On the 10th and 11th ultimo I held public sittings in the Council Chamber of the Guildhall, and the rest of the time was employed in a personal inspection of the town, in the examination of the adjacent watersheds with a view to its future supply, and in obtaining data generally for this Report.

3. I have to acknowledge the cordial support of the mayor, corporation, and corporate officers, and to mention that the plans, sections, and data of various kinds placed at my disposal, were by far the most complete that I have as yet met with, having been, many of them, prepared to facilitate the present inquiry. I have also derived much assistance from the recent Report of Mr. Page to the Office of Woods and Forests, on the subject of certain proposed water-works.

4. The evils, both of scarcity of water and absence of drainage, and the prevalence of certain diseases in the lowest parts of the town are universally admitted, and all classes seem anxious to forward any reasonable plan for their remedy.

5. I was accompanied, throughout, every day, by the mayor Mr. Millett, and the corporation surveyor Mr. Matthews, and, in addition, while engaged upon the watersheds, by the partner of the Town Clerk Mr. Darke; and while upon the courts and alleys of the town, by the surgeon to the Union, Mr. Boase.

6. The plans and sections prepared by the corporation are to a scale sufficiently large to be immediately made use of, upon the formation of the local Board, and the commencement of the proposed works.

7. PENZANCE, the most western town in England, the principal trading port, and the second harbour in Cornwall, is a mu-

nicipal borough, erected in 1614, and including in its limits rather more than a semi-circle of half a mile radius, of which the sea-shore forms the chord, and a point in the middle of the town the centre, marked by a granite cross let into the ground, and by a much older upright cross, recently removed a few yards and set up against a wall.

8. Penzance lies on the west or sheltered side of Mount's Bay, and has a frontage, with its suburbs, of about a mile and a quarter on the sea, of which the eastern three-fifths is a cliff from 20 to 40 feet high, falling eastward, and the western two-fifths chiefly a raised embankment or esplanade, falling westward. Between the two is a bold prominence or headland, from which springs the old or shorter pier. The new or eastern pier is connected with the eastern cliff. It is the longer of the two, which together form a tidal harbour of about 21 acres area.

9. The western margin of the town is very low, and, behind the esplanade, swampy. Elsewhere the land rises at once rapidly from the crest of the cliff, so that the town is built on the side of a hill, which behind it reaches an elevation of about 220 feet. The eminence thus formed is bounded east and west by two rapid mountain streamlets, which descend from the granite districts on the north, and flow down deep valleys into the sea, one just outside each boundary of the borough. Of these streamlets the western, Alverton or Lariggan Brook, will be afterwards referred to; its channel near the mouth runs through low and swampy ground, occasionally flooded at spring tides, and but for this circumstance, the best situation in the town for marine villas, and building property of a most valuable description.

10. The eastern, or Chyandour Brook, has a longer course. It descends from the celebrated Ding-dong tin mine, and upon its course are various mine works, which send it into the sea of a deep red colour.

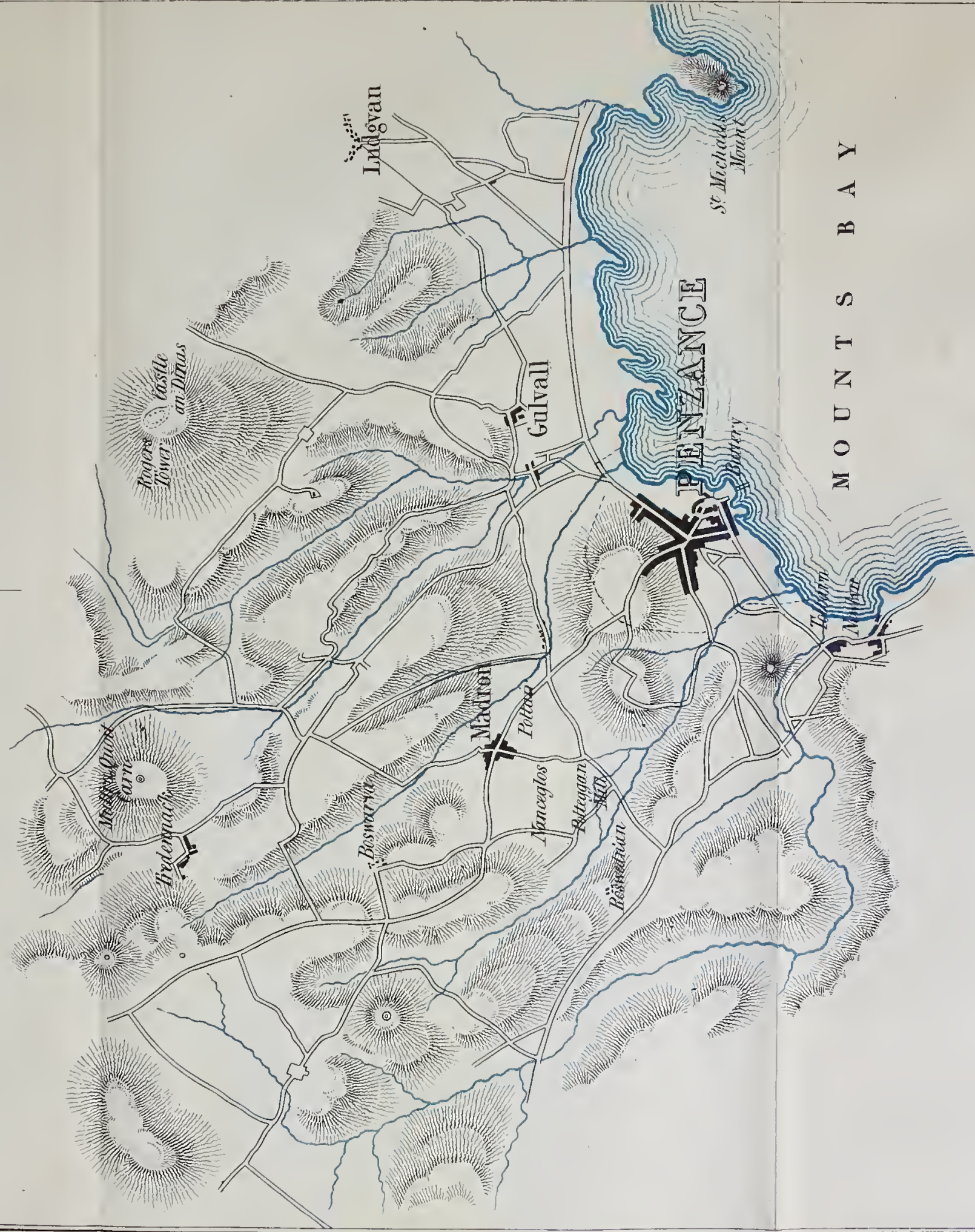
11. Beyond Chyandour, and about a quarter mile eastward of the borough limits, is the mouth of another and much larger rivulet, that of Ponsondean, and beyond this again is a long and broad tract of low land, called "The Marsh," crossed by the Hayle-road, divided from the sea by the Marazion road, and in all respects well suited, being to leeward of the town, for sewage distribution.

12. Besides the two main valleys that bound the borough, should be noticed a third, or cross valley, containing four streamlets, which descend from about Madron, and of which three supply most of the public spouts of the town.

13. GEOLOGY.—The borough rests upon greenstone, celebrated for its fertility, but is encompassed landward by granite. A considerable part of the town, however, rests immediately upon a sort of red marle, seen in the eastern cliff, and through which most of the proposed main sewers will be carried.



Ding Dong Mine



Scale.

8 7 6 5 4 3 2 1 0

2 Miles

14. **TRADE.**—The staple of Penzance is its fishery, employing about 2000 hands, and 300 sail of large fishing-boats. The population of the surrounding rural districts are chiefly engaged in the tin and copper mines, and operations connected with them. No copper, however, is smelted here, nor is any operation carried on, regarded generally as deleterious.

15. **CLIMATE.**—The climate of Penzance is reputed to be mild but moist. The average annual rain-fall is about 45 inches. The prevailing wind is south-west, and though mild in temperature, sufficiently strong to ensure a thorough ventilation in every main street. This does not apply to the courts and alleys, which are very close, though by a little management they might be fully opened to the healthy sea-breeze.

16. **LIMITS AND GOVERNMENT.**—Penzance, though a municipal borough, is within the parish of Madron. It is, however, a distinct township and chapelry, and elects its own overseers and parish officers, and has a distinct poor's rate. The boundary of the borough is not, indeed, exactly co-extensive with that of the township, of which a few fields lie outside the half-mile radius, while, on the other hand, a few fields are included within the borough that are not part of the township.

17. The borough is divided into an east and west ward. It is under the government of a mayor, six aldermen, and eighteen common councilmen, twenty-four in all, under whom the business of the borough is transacted by various committees, among which are those for fire, water, and sewerage. The streets and roads are managed by the Board of Highways for the township.

18. **LOCAL ACTS.**—There are two Local Acts in operation, one, 37 Geo. III., cap. 31 (16th June, 1817), the other, 3 Vict., cap. 72 (19 June, 1840), an extension and amendment of the first. Both relate to the pier: the corporation derive a considerable part of their revenue from the tolls and dues collected under these Acts, but they do not affect the local management of the borough.

19. **POPULATION.**—The population of Penzance in 1841 was 8578, and is now estimated at about 9500. The annual average of deaths during the seven years since 1841 has been $189\frac{2}{3}$, or on the mean estimated population 20·9 per 1000, or on that of 1841, 22 per 1000.

20. It appears, from a partial analysis of the diseases and deaths in Penzance from July to November, that there were 123 cases of dysentery reported by the Union surgeon alone, which included 16 deaths. Of the 25 localities in which these cases occurred 18 are either in the lowest part of the town, near to, though shut out from, the sea, or in certain parts of the higher town remarkable for their filth and want of drainage. The total number of the

cases of dysentery has not been ascertained, but the total number of deaths from this disease in three months, as reported by the district registrar, were 79. The observations above made as to localities apply to the whole of these deaths.

21. The cholera visited Penzance in 1832, and prevailed chiefly in the lower parts of the town, along the margin of the sea, and about the root of the pier, still one of the filthiest quarters of the town. The cholera deaths in September, October, and November, 1832, were 64. The cholera created great alarm, but these figures show that it was a much less serious evil than the dysenteric disease, of which little was said.

22. In 1841, Penzance contained 2027 houses, of which 1750 were inhabited, and 277 vacant or building. It now contains, according to a statement prepared from the last poor rate, at my request, by the town clerk, 1739 houses inhabited, and 199 uninhabited, in all 1938,

23. The area of the borough is 438 acres.

24. SEATS OF DISEASE.—Having been furnished by the medical officer, and clerk of the Union, with an ample list of localities in which *epidemics, endemics, and diseases of the bowels*, had recently prevailed, or were prevailing, I proceeded, in company with the mayor, the medical officer, and the surveyor, to visit these and other parts of the town. The following are a few of the spots most deserving of mention. They are but a small fraction of the whole brought under my notice or marked as seats of fever and dysentery.

25. *St. Clare-street*, though high, is not drained, and from it a number of small houses are arranged in courts, chiefly on the east side. In many cases the ground rises behind the houses, and drains upon them. The courts are small, close, unpaved, or badly pitch-paved, in holes, without drains, but with an open irregular gutter, about a yard from the back front of each house. This commences high up, receives the overflow of the cesspools and privies of each house, and being full of hollows forms a number of little stagnant offensive pools close to each door and window. In some cases the people block up this gutter above them with earth, and thus, at the expense of their neighbours, gain a temporary respite in dry weather.

26. In the yard of each tenement is a privy, usually in a very bad state, both of repair and cleanliness. On one side of it is an open cesspool, which receives its contents, and all the filth of the tenements of every kind. In some yards is a slaughter-house, and in many a piggery, the blood and manure from which are thrown into, or rather upon, the cesspool, of which the solid contents are usually piled up above its margin. The effect of a shower of rain, a pretty frequent occurrence, in flooding such a cesspool, privy, and open gutter, may be conceived.

27. This description applies more or less, and usually very closely, to *St. Clare-terrace*, *Pendarves-row*, and the quarter of the town about *St. Clare-street*, and above the *Fountain Inn*, parts all higher than the present water supply, and all without the semblance of a proper drain. In Causeway head, just below these, where the state of things is nearly as bad, the complaints of the people were loud, and the effluvium, during my visit, was very foul and affected the interior of the houses.

28. At the back of these districts the alleys leading to the backs, of the premises are narrow and unpaved, and quite impassable, being used by the people as public necessities.

29. In the older and more densely peopled parts of the town, near the *Battery* bathing place, quay, and pier, the state of things is somewhat different. Here, owing to the want of space, many of the tenements have privies, and often cesspools under the roof of the dwelling-house, in other cases the filth from an upper story is discharged by an open shoot into the court or passage below, others are absolutely without a convenience of any kind, and discharge their filth from time to time direct into the street, or over the wall into the harbour above tide-level. Though close to the shore, this quarter of the town is so intricately arranged, that very little of the sea-breeze finds its way into the courts.

30. It is impossible in words to convey an adequate idea of the filth of this quarter, in which the cholera prevailed formerly, and from which epidemics or diseases of the bowels are rarely absent, and yet the whole stands upon a cliff 20 to 30 feet above high-water mark, and is in no part 100 yards from the face of this cliff. Its position, moreover, is exactly opposite *St. Michael's Mount*, and is naturally, in all probability, one of the healthiest, as it is certainly one of the most beautiful positions upon a bay proverbial for its salubrity and beauty. It would be difficult to find a spot so foul in which life is so seriously affected, or which it would cost so little to make pure.

31. Although the places mentioned are the worst, there are many others approaching very near to them in dirt, damp, and sickness. Such are a number of low houses upon the western side of the town, and upon the low ground behind the *Esplanade* and *Marine Terrace*. Here are the same repeated cesspools, privies, piggeries, and open gutters; and, in addition, a low marshy soil, not naturally drained, and, from its position, less exposed to the drying effects of the wind. Still, though low, this district admits of being drained naturally, and no doubt the present ill-built tenements will before long give way to a class in better keeping with one of the best situations in the town.

32. On this western side of the town, though higher and closed in between two main streets, is *Buryton-row*, in which the houses, many of them, have no yard or convenience whatever, but discharge their filth at once into the common street.

33. The east side of the town has everywhere an excellent fall towards the sea, but no advantage has been taken of this circumstance to secure anything like drainage. Here also there are ruinous or ill-constructed privies and open cesspools, the overflow of which is exposed in gutters and ditches, fringing the houses and the courts.

34. The north and south sides of *East-street, Camberwell, Adelaide* and *Penwith-streets*, and others close around them, may be cited as very bad indeed.

35. **LOW LODGING-HOUSES.**—Of low lodging-houses there are eight, in various parts of the town. The description of persons frequenting them are dirty and objectionable, requiring the surveillance of the police. There are 19 beer-shops in the town, and 23 licensed public-houses.

36. **PUBLIC WALKS AND FOOTPATHS.**—The public walks and footpaths about the town and along the sea are numerous, well-formed, and dry. Near to some of them, however, are open stagnant ditches, into which part of the town refuse finds its way.

37. **FIRE.**—It appears that the losses from fire over a period of 12 years have averaged annually about 233*l.*,—rather a considerable sum, and one which an efficient water supply would probably have saved. There are at present two fire-engines in the town. During a fire the water from the reservoir is let loose to run down the streets, and dammed up by sand-bags opposite to the fire. This process is very inconvenient to the inhabitants; in all cases the supply thus afforded is insufficient; and, where the fire occurs either above the reservoir, or out of the direct line between the reservoir and the sea, it is, of course, wholly inapplicable, and there is no other supply whatever.

38. The **PUBLIC BUILDINGS** are numerous, and include a new town-hall, a chapel, church, a chapel of ease, various other chapels, national and other schools, and a borough prison. The latter I found very clean, and nearly empty. The old workhouse has recently been prepared as a cholera hospital, in case that disease should a second time visit Penzance.

39. The **MARKETS** until lately were generally, and some still are held in the public streets, a nuisance that should no longer be tolerated. The meat-market is now held under that part of the building of the town-hall used as a corn-market. A new and commodious covered room has been recently opened as a poultry and fish-market. The fish-women, however, decline taking possession of it, and still expose their fish for sale in the main street, in front of the town-hall, a less objectionable spot than that formerly occupied by them, but very inferior to the new market, out of which they should not be allowed to sell. A green-market is held in the street, near the Cross, and in front of one of the chief hotels. Proper yards near the verge of the

town have been paved and enclosed for the beast, cattle, sheep, and pig-markets.

40. **SEWERAGE AND SURFACE-DRAINAGE.**—With one trifling exception, it does not appear that any sewer in the town is calculated to drain an under-ground cellar or kitchen: there are, in fact, no sewers in Penzance.

41. In some of the streets are covered drains with grates taking the surface-waters for a certain distance, and then discharging them again into the gutter of a lower street, or occasionally by an opening or "bolt" into open ditches near the town. These latter are a source of great offence, being pounded up by the land-owners and market-gardeners for the manure. There are such in the Vicar's Fields, North Parade, near a public walk; in the public highway, at Atherton; and in the street near the Cross, receiving the waters from Causeway Head; others fall into the sea, trickling down the quay wall on the cliff within the harbour, and producing a great nuisance exactly at the point where vessels commonly take the ground for repairs. The cesspools containing the house-filth, a part of which should be removed by sewers, are at present wholly in the hands of the house-owners or occupiers, who arrange for its sale and removal by private contract.

42. It is difficult to obtain any exact data as to the sums received for this manure, but the result of numerous inquiries places it at about two tons per house per annum, valued at 1*s.* 6*d.* per ton, which, upon 1739 inhabited houses, would be 260*l.* 17*s.*, a sum probably very much within the real amount.

43. This is collected and removed by the farmers once or twice annually, and carted away about two miles, costing, in addition to its purchase, about 2*s.* 6*d.* a ton, or, including that item, about 4*s.* per ton, before it is finally spread upon the land. Taking each house as yielding two tons, about 695*l.* 12*s.* per annum will be the expenses incurred in the use of the manure. I have no doubt whatever that this estimate is much below the truth, since the street scrapings of the town (exclusive of this) sell alone for about one-fourth of the sum.

44. No sewer rate has been levied; whatever has been done has been paid for out of the highway rate, or by private persons. There are upon the piers three public necessities for mariners.

45. Owing to the natural fall, there is little difficulty in getting rid of the surface waters. They scour down the streets and gutters, perform much of the work of the scavenger, and flow at once upon a great many points into the sea.

46. **HOUSE DRAINAGE.**—There is no house drainage in Penzance, and the condition of the houses for want of it has already been described.

49. **WATER SUPPLY.**—Penzance is at present dependent for

water upon about 53 private wells and pumps, and six public pumps, of which at the time of my visit, at a wet season and day, four were out of order and yielded no water. There are also six public cocks or spouts fed by pipes from a reservoir about 126 feet above the quay, but below the higher parts of the town.

48. This reservoir, constructed 1759, and amended in 1797, is an open brick basin, walled in, and holding about 11,331 gallons. It is fed by a stream, into which flow three streamlets, which rise respectively near Nanzeglos, Poltair Moor, and Madron Village, and are led in an open or partially covered channel, about $1\frac{1}{4}$ miles from their final junction to the reservoir, supplying one public cock in the town by the way.

49. From the reservoir a 5-inch pipe, at first of clay, and afterwards of iron, descends to supply five public spouts placed in conspicuous and convenient places in the town. Even these, however, are most imperfectly supplied. The source is the reverse of plentiful, and much is lost by bad arrangement in the way. These spouts are fixed between 6 feet and 96 feet above high-water level, and a part of the waste of the upper spouts contributes to supply those below.

50. Besides these are three other spouts fed by springs and independent of the reservoir.

51. The town supply from all these sources is never very copious, and in the summer months quite inadequate. It is also badly husbanded and badly distributed, and most of the people have to go some distance for their daily supply. Hence, especially in summer, when they purchase the water, the poor economize its use as much as possible at the expence of cleanliness and health.

52. In dry seasons water-carts are fitted up and water brought from Alverton brook, near Lariggan, and sold at about $\frac{1}{4}d.$ or $\frac{1}{2}d.$ per hand pitcher; at such times those who possess private pumps aid their poorer neighbours. The want of water is however, severely felt.

53. Water is also much needed for the shipping; 10 to 15 vessels a week enter the harbour, and many that would enter if there was a water supply remain outside, and water at Chyandour, Alverton, or in Guavas lake, a small roadstead in the bay. I have been quite unable to satisfy myself as to the quantity of water at present supplied to the town, but there is abundant evidence of its being at all times inconveniently given, and during some months of the year quite insufficient even for domestic use. The complaints on this head were loud and universal from all classes. The defect in quantity is no doubt made worse by bad arrangement; for at the time of my visit (besides the pumps) several of the spouts from the reservoir were dry, and this when the reservoir itself was overflowing, and there was a rill of water in every gutter.

54. The expenses of the public water supply are about 15*l.* pe

annum, borne by the corporation; no water is sold, and no private supply recognised. There is no income of any kind.

55. **PAVING.**—The main streets of the town are either paved or Macadamised, chiefly the latter. The principal footways are almost all flagged with granite slabs.

56. In the smaller streets the paving is very deficient indeed. The narrow lanes behind rows of houses are not paved at all, and are, many of them, in wet seasons impassable.

57. Material for paving is to be had cheap and good. Broken elvan, ready to spread, costs 2s. 3d. per ton; good granite flagging laid, 7d. and 8d. per superficial foot. Beach pebble pitching is about 10d. per superficial yard.

58. The foot and carriage ways are managed by the Highway Board, elected annually from the township or vestry. The Board appoint also annually a surveyor under the present Highway Act.

59. The highway rate is granted separately in vestry. Its average annual amount during the last five years has been 9d. in the pound, rated value, producing on an average 761*l.* 19*s.* 10*d.* The produce of the rate ought to be larger, but about 12 per cent, is relieved by the magistrates, on the ground of the poverty of the occupiers of small houses of which the owners are not rateable, an evil, the cause of much and well grounded discontent, and removed by the present Act.

60. **SCAVENGING AND WATERING.**—The scavenging is under the same management with the paving. It includes only the refuse cast into the broad highways, and ordinarily takes no cognizance of alleys, house dust, or refuse. This indeed, in some cases, as in part of Buryton-row and the market place, where the house filth is emptied at once into the street, involves the removal of such night-soil as does not flow down the gutters.

61. The cart is at work daily, and removes one portion of the dirt; another portion, in wet weather, is swept into the gutters, and carried off by the rapid flow of water. The courts and alleys, into which the cart cannot enter, are cleansed by individuals, or rather are seldom if ever cleansed at all.

62. The scavenger's establishment consists of one horse and cart, and five men; the street sweepings are collected in three depôts, one in the harbour, and one at each end of the town, clear of the houses, but on the high road.

63. The annual expense of this department is, on an average of five years, 220*l.* 11*s.* 4*d.*, against which is to be set an average annual income of 173*l.*, derived from the sale of the sweepings to the farmers as manure.

64. **LIGHTING.**—The town is lighted with gas, supplied by a private company established in 1830, and which, for some years

past, has paid no dividend, having spent considerable sums in enlarging the premises.

65. There are 121 public lights, which are charged at the rate of $\frac{1}{2}$ d. per lamp, per hour lighted.

66. The lamps are stated to be lit from October to March, and the expense attendant upon lighting, cleansing, and repairing them, is borne by the town, and absorbs a rate of from 400% to 450% per annum.

67. There are about 190 consumers of gas in the town, who are supplied by meter at 8s. per 1000 cubic feet.

68. The operations of this gas company are as unsatisfactory to the town, as to their own shareholders. The public lights are very inefficient, and are cut off altogether on moonlight nights. Newcastle coal, employed on the works, is delivered at 17s. 3d. per ton; and the works are on the harbour side, so that there is no excuse for the present high price, which is fatal to the general use of the gas, and to the prosperity of the works.

69. The present state of the gas works is an evil severely felt in the town.

70. PUBLIC NUISANCES.—These are tolerably numerous. The most considerable are the slaughter-houses, of which there are 14 in the town, of which nine are in one street. Many of these are kept as clean as circumstances will admit; whitewashed and washed down, and sanded; but even in these cases, the blood is thrown into the cesspool of the dwelling-house, and the smell is usually most offensive.

71. In several of the larger squares and courts are open dung-heaps and cesspools, nuisances which deserve to be called public. There are such in "The Square," "The Cherry Garden," "Battery Square," &c.

72. Also there is a filthy dépôt for scavengers' dirt within the harbour, fed by a drop from the cliff, and very foul and offensive. The two others, near the road side, at each end of the town, have been noticed already.

73. The vegetable or green-market held at the Cross, and the fish-market held on both sides of East-street, in front of the Guildhall, are both serious pests to passers by.

74. Other commodities are also sold at stalls in the narrow street about the Guildhall, blocking up the thoroughfare already too narrow. This matter, however, the corporation are about instantly to amend.

75. SUBURBAN SURFACE AND DEEP DRAINAGE.—The lands around the town are, in part, only under-drained, and the land-owners seem scarcely aware that high and steep lands are not necessarily well drained by nature. The land above the town is not, however, particularly wet. That about the town, on the

east, has been recently underdrained, at a considerable expense, but very efficiently, by Mr. Bolitho. On the west side there is a tract of low marshy land on the verge of the borough boundary, rendered swampy by the Alverton Brook. This is actually a nuisance, and prospectively a very serious one, since owing to the sandy beach, the construction of the Esplanade, and the shelter afforded by the high ground above Newlyn, this is the quarter in which the town will extend, as a watering place, and in which the best class of marine villas will be built, and accommodation generally afforded to invalid visitors.

76. The remedy for this evil by the proper management of the Alverton Brook, is of great consequence to the reputation of the town as a residence for invalids.

77. PROPOSED ARRANGEMENTS—Water Supply.—This subject has of late received much attention, projects for supplying the town having been brought before Parliament in 1848, both by the corporation and by a private person opposed by the corporation, who again deposited plans, and gave notice of his intention to apply for an Act, but does not appear to have proceeded to comply with the standing orders.

The schemes of last year were reported upon by Mr. Page, the surveying officer sent down by the Commissioners of Woods and Forests, and the result was a recommendation of a modification of the corporation plan, in substance what I have now to recommend for adoption.

78. The population of the township to be supplied, may be taken in round numbers at 10,000 persons, inhabiting 2,000 houses.

79. A supply of two cubic feet, or $12\frac{1}{2}$ gallons per head, per diem, will be sufficient for domestic consumption, and double that allowance will cover an addition for street-cleansing, and other sanitary purposes, including 750 cubic feet for shipping in the port. There are no great consumers in the town.

80. The proposed supply will be 40,000 cubic feet, or 250,000 gallons daily. It will be necessary, however, in settling a proper source, to be prepared to supply a much larger quantity, if at any future time such should be called for.

81. The streams from whence the supply will be drawn are five in number, and rise all in the granite district of Madron, north of Penzance; and all are so clear as in all weathers to be independent of artificial filtration.

82. Of these the principal already noticed, as the Alverton Brook, descends by two heads from Lanyon and Boswarva. Upon their combined streams at Trengwainton are three considerable pools, below which at Hendra a part of this water, and, in dry weather, the whole of it, is drawn off by a leat or open channel

to feed Polteggan Mill. This stream is perpetual, and usually very copious, a proof of which is that the mill, with a very small pond, can, even in the driest season, work eight hours a-day.

83. It is proposed to include this mill-lead in clay piping, allowing a supply in each field for watering cattle, and to convert the present mill-pond into a small storage reservoir, containing eight days supply.

84. This stream is very copious; but it will be prudent either to rent the mill for a long period, or to purchase the right of withholding its water for a certain number of days in the year.

85. From the storage-reservoir a main conduit of iron piping will be led along the highway, 2,270 yards, to Chapel-street, Clare-hill, where it will terminate in a service-reservoir, holding four days' supply.

This service-reservoir will be 22 feet below the storage-head, and the conduit-pipe will dip at one point 33 feet below its lower end.

86. In parts of its course the conduit-pipe will receive supplies from four other streams derived from the Madron district, both above and below the church. Three of these streams at present supply the town; and it seems to have been generally admitted, in last year's evidence, that these were alone capable, if led in proper channels, of providing the augmented supply then proposed. It is difficult to arrive at a satisfactory opinion upon this point; but it may be stated that, since the recent enquiry closed, the town surveyor has gauged the four principal streams, including that from which the Polteggan Mill is fed, and the result for the month of May gave for the—

Polteggan Stream	.	401,760	gallons per 24 hours.
Spring East	.	151,200	„
Nanzeglos	. . .	51,840	„
Madron	. . .	30,240	„
		635,040	„

Some of these springs have been gauged also in March and July, and the general result seems to show a falling off to about one-fourth of the above quantity, leaving therefore in the driest periods a daily supply of about 158,760 gallons, or 25,400 cubic feet; which, in addition to the quantity in the reservoirs, will amount to a supply for about a month—a period which, in the moist climate of the West, never elapses without rain.

87. If more water be required it may be readily gained by enlarging either the storage or the service-reservoir, or even by forming small reservoirs upon the intermediate streamlets below Madron.

88. The service-reservoir at St. Clare will command the whole

township of Penzance, giving 30 feet pressure at St. Michael's-terrace, the highest ground built upon or very likely to be built upon—and 194 feet pressure at the quay and lower parts of the town.

89. From the service-reservoir street-mains will descend into the town, supplying the houses, street fountains, and market fountains, and giving a jet in each thoroughfare that will place the town out of the reach of any very serious fire, and by the aid of hose watering the ships in the harbour at once from the quay.

90. The estimate provides a fire-plug upon every street main at each hundred yards, with hose and street-cleansing apparatus. It provides also for the town fountains, and for the harbour supply, and for a service-pipe into each house, and each privy (to be converted into a water-closet) in the town.

91. The details of the income to be derived under the proposed arrangements stand as follows:

The houses in the borough rated at an annual rack rent of—

Amount of Rack Rent per Annum.	No. of Houses.	Gross Estimated Rental.	Five per Cent. on Rental, charging no House less than 4s. 2d. or more than 40s.
£.		£. s. d.	£. s. d.
Not exceeding 3	429	1,155 13 4	89 7 6
Above £3 and not exceeding 5	401	1,730 13 4	88 16 2
„ 5 „ 10	428	3,196 15 0	159 16 9
„ 10 „ 15	130	1,718 3 4	85 18 2
„ 15 „ 20	107	1,941 0 0	97 1 0
„ 20 „ 30	97	2,531 3 4	126 11 2
„ 30 „ 40	56	2,068 0 0	103 8 0
„ 40 „ 50	29	1,340 0 0	58 0 0
„ 50 „ 60	18	1,023 0 0	36 0 0
„ 60 „ 70	20	1,334 0 0	40 0 0
„ 70 „ 80	7	537 0 0	14 0 0
„ 80 „ 90	10	883 0 0	20 0 0
„ 90 „ 100	3	296 0 0	6 0 0
„ 100 „ 110	3	325 0 0	6 0 0
„ 110 „ 180	1	180 0 0	2 0 0
No. of Unoccupied Houses on the Rate opposite to which no Rents are carried out . . .	1,739	..	..
	199	..	..
	1,938	20,259 8 4	932 18 9

92. The sums in the last column are calculated on a charge of 5 per cent. on the rated rack rental of each house, cutting off the excess upon rentals of above 40l., and charging no house at less than 1d. per week. This is a very fair and moderate charge, and when proposed last year under the Corporation Water Scheme, met with general approval in the town.

	£.	s.	d.
Income as above stated from 1739 private houses, producing an aggregate rental of 20,259 <i>l.</i> . .	932	18	9
Shipping	50	0	0
Brewery, hotels, gaols, &c.	50	0	0
Special charge of 5 <i>s.</i> per annum for water-closets upon 351 occupied houses of above 15 <i>l.</i> rental	87	15	0
	1120	13	9
Deduct for bad debts at 5 per cent.	56	0	0
Management and repairs	150	0	0
	206	0	0
Nett income.	914	13	9

93. SEWERAGE AND DRAINAGE.—It is impracticable, however desirable, to combine the sewerage of the town in one outfall. The western ward must be drained westward towards the Alverton Brook, and the eastern ward eastward towards Chyandour. By this arrangement about three-sevenths of the area of the borough, including about three-fourths of the houses, will be drained to leeward, and in the direction of the eastern lowlands.

94. The prevailing winds are so decidedly west, that there would be no fear of any effluvia (should such exist) from this side being returned upon the town. A small portion of the central part of the town, including about 100 houses, will be drained into the sea at the outside and back of the old pier, between it and the battery at low water-mark.

95. The remaining or western portion of the sewage could, if desirable, be employed in manuring the lands towards Newlyn, or may be discharged at once into the mouth of the Alverton Brook, and thus carried with considerable force into the sea.

96. The details of any measures beyond the complete removal of the sewage, belong to the head of sewage distribution; but whether the sewage east and west be employed in irrigation, or whether it be discharged by means of the two brooks into the sea, it will be necessary to extend the boundary at each end of the borough for the purposes of main sewerage.

97. It is highly probable that the sources of the proposed water supply will be found so ample as to render it unnecessary to interfere with the stream which is at present distributed through many of the town gutters. In that case, these waters may be arranged so as to fall into the street sewers, near their heads, and thus keep up a constant current, capable of being cut off should the dilution be too great for agricultural purposes.

98. The disposition of the surface of the town is such, that while the main sewers will be of moderate length, the points of discharge into them will be numerous. One advantage of this will be the removal of any risk of flooding the lower parts of the town

by water from above, and another that it will allow the use of clay pipes of very moderate capacity as street sewers throughout, except in the lowest part of the two main sewers.

99. The house drainage arrangements will be very simple and inexpensive. A pipe-drain will be laid down from each house and yard into the adjacent sewer, and over each of its heads will be the water-tap, in one case of the house in the other of the water-closet: so that the water supply, including the rain fall, will find its way through the house drains into the street sewers, and will keep the whole passage clean and open.

100. **SURFACE DRAINAGE.**—Penzance does not receive drainage waters to any extent from without, and it will therefore be necessary to provide only for the removal of its own rain water.

101. The fall is at times very considerable, but not more so, even when the water from the present reservoir is added to it, than the street gutters will be able without any inconvenience, and indeed rather advantageously than not to the streets, to convey away at once into the sea.

102. The house drains and sewers will take the water from the roofs, courts, and gardens.

103. Some of these street gutters will require to be so arranged as to discharge the waters at once into the sea at the nearest point, and towards the lower openings, pipes must be provided and carried through the quay walls.

104. The great steepness and shortness of the streets, and the excellence of the material used for flagging and for gutters, are circumstances very favourable to the rapid discharge of the surface waters at very numerous points, and without injury to the roads.

105. **BOUNDARIES.**—Under the proposed arrangements, the storage reservoir, its feeder, and the main conduit nearly to the service reservoir, will be just outside the boundary of the borough; but as the property in the reservoir and feeder will be almost necessarily purchased by the corporation, and the main conduit will be in the highway, there seems no reason for extending the administrative area on this account.

106. For the purpose of main sewerage outfall, however, and for such only, it will be necessary to extend the boundary on the east to the further bank of the Chyandour Brook, and on the west to the further boundary of the Alverton Brook, in order to secure a proper channel and back-water for the dilution and immediate removal of the surplus sewage with proper force into the sea.

107. The areas thus proposed to be included will be very trifling, and are both of them within the mother parish of Madron. They are shown upon the annexed map.

108. **SEWAGE DISTRIBUTION.**—It appears from what has been stated, that at this time the refuse of Penzance, including road

[2.]

scrapings and house refuse from the cesspools, is in considerable request for manure, and that to obtain it, expenses are annually incurred of at least 870*l*. Great part of this manure is disposed of mixed up with broken crockery, stones, earth, pulverized granite, and various other matters, some of which are injurious, and others in no way useful in agriculture. A far larger portion of the actual and really valuable manure is allowed to soak into the earth or to drain away into the street gutters.

109. In the proposed arrangement of the sewers it will be observed, that they are concentrated upon two principal outfalls, of which that to the east or leeward, receives the drainage of about 1471 houses, amounting probably to about 3 cubic feet per house, or 4400 cubic feet per diem, and is estimated as led into the Chyandour Brook, a few yards above its opening upon the sea.

110. Supposing the demand for liquid manure at once to warrant the distributary arrangements, this sewer must be led across both the Chyandour and Ponsondean Brooks, and along the edge of the eastern meadows, parallel to the sea, for a quarter of a mile, where an outfall will be constructed, and a small steam-engine erected, by which the sewage will be pumped up into a reservoir on the opposite high grounds, and distributed over the valley, east and west.

111. The westerly winds so completely prevail here, that under no circumstances is it likely that the reservoir, or any of the works connected with it, can annoy the town or its eastern suburb. It will however be possible, at a very moderate expense, to cover over the reservoir with a light impervious roof of tiles laid in cement.

112. The circumstances of the western outfall are very similar, and will require nearly similar arrangements. Here the outfall will drain about 397 houses, estimated to yield daily about 1200 cubic feet. Its contents, in the estimates of sewers, are considered to be discharged into the Alverton Brook, a few yards above its entrance into the sea; but if the sewage is turned to account, by being distributed over the tract between the Wherry and Newlyn, it will be necessary that it should be pumped up by machinery. This may be done most completely by steam-power which, should the demand be considerable, may be well afforded. It is possible, however, I believe, to employ during 11 months in the year, the water-power of the Alverton-brook to pump up the sewage into a reservoir, and when that power is not available, the sewage might be turned at once by that brook, which is never absolutely dry, into the sea. It is sufficient at present merely to indicate the practicability of this arrangement.

113. Notwithstanding the mass of evidence made public concerning the use of liquid manures, I scarcely feel myself in a position to state definitely what return may be expected from its employment upon the low marshy green-stone soils near Penzance.

Two things appear certain, one that the sewage waters will contain the whole of the town-manure, of which at present the most valuable part, in its detention of 6 to 12 months, either evaporates into the air, or sinks into the earth; and the other, that the whole can be supplied at a price out of all proportion less than that now paid for its least valuable part.

114. The sewage of the outfalls will command a wide extent of land within reach of the markets of Penzance, Marazion, and Hayle.

115. There exist no circumstances to make the distribution of the manure peculiarly costly, perhaps rather the contrary. The ground is low, and the power required will be moderate. Wherever liquid manure has been fairly applied, the rental of the land has risen very considerably, and it cannot be doubted that such will be the effect of its application upon the lands east of Penzance.

116. ESTIMATE.

WATER SUPPLY.

Expenditure

	£.
Reservoirs	806
Pipes	3704
Fire-plugs and house service . .	3046
Total	<u>7556</u>

Income.

	£.
House supply	933
Shipping	50
Great consumers	50
Water closets	87
Total	<u>1120</u>
Deduct for bad debts, at 5 per cent.	£ 56
Management and repairs . .	<u>150</u>
	206
Nett Income	<u>914</u>

117. SEWERAGE AND HOUSE DRAINAGE.

Expenditure.

	£.
Eastern outfall	1471
Western outfall	1094
Sub-mains	913
House service	2946
Total	<u>6424</u>

118. ABSTRACT OF EXPENDITURE AND INCOME.

Expenditure.

	£.
Water works	7,556
Sewage and drainage works.	6,424
	13,980
Contingencies 10 per cent.	1,398
Total	15,378

Income.

	£.
Water works	1120
Deduct for empty houses, management and repairs	206
Nett Income	914

Average annual payment, principal and interest at 5 per cent., calculated to pay off the sum of 15,400*l.* in 30 years 911

Surplus balance £ 3

119. With reference to this estimate, I have to request the attention of the Board, first, to the fact that although the data afforded to me were unusually ample, yet that they related to the greater lines of water and sewer mains, and not to the branches and house details, points both materially affecting the estimate; and, 2ndly, that the heavy pressure from other quarters prevented me from giving more than four days to Penzance. I believe that my estimate of expenditure will be found in excess; but I cannot claim, for a report and estimates made upon data not expressly provided under my direction, and upon so short a consideration of the subject, the respect that might be thought due to a matured opinion and more minute calculations.

120. I may also, for the information both of the Board and of the people of Penzance, point out what sort of accommodation is proposed to be provided under these estimates.

121. In the first place there will be a supply of pure water, fitted either for drinking or washing, always on, in unlimited quantity, in every house. In the poorest houses there will be a pipe and tap, either in the room or within three feet of the door, and a branch and second tap to the water-closet in the yard. It will be in the power of those who choose, to have the pipe carried up to the tops of their houses. The pressure commands every upper chamber in the town. The pipes will be laid at a depth sufficient to preserve a uniform temperature; and, as the water will be drawn at once for consumption from the pipe, instead of being husbanded in tanks and water-butts, it will not be exposed to be rendered foul by soot or dust, but will flow out clear and sparkling, as it may now be seen above the Polteggan mill leat.

122. For this accommodation the poorest class of houses will be charged 1*d.* per week, and no water-rate can be made compulsory under the Act at more than 2*d.* per house.

123. In case of fire every house will be within reach of hose from a fire-plug, as will every ship within a moderate distance of the pier or quay. The streets will be washed in dirty, and watered in dusty weather, by more moderate jets from the same

plugs. A fountain, throwing up 900 gallons per hour, to a height of 30 to 40 feet, can be fed for about 1*d.* per hour.

124. By the drainage arrangements there will be provided from beneath the water-tap, a sink and pipe leading into the street sewer. The privy, converted into a water-closet, will be furnished also with a drain. The existing cesspools will be declared nuisances and filled up, and in their stead each landlord will be called upon to provide a proper bin for the dust and dry refuse of the house. In estimating the source of income the general rate has been taken as for water supply only. It should be understood, however, that, in practice, it will be divided between a water and a sewer-rate, the former levied upon houses only, the latter also upon land, but in the proportion of but one-fourth of the house-rate. The water-rate alone will be rather above, the sewer-rate rather below, one halfpenny per week upon the poorest houses. It may be mentioned as an instance of the economy of a comprehensive measure, and of the advantage to a town of retaining its water supply in its own hands, that the above charge, for water and sewage combined, is not higher than the tax which, had the late Water-works Bill for Penzance passed into a law, would have been paid by the town for water only.

125. The whole of the arrangements of all kinds will both be executed and kept in order by contract; and from each dust-bin, from time to time, the contractor's people will lift out the full box or bucket, insert an empty one, and place the other in a cart in the street. In this way there will be no excuse for any accumulation of filth either in the houses, yards, or streets.

126. Into the question of paving the alleys, and a better and more economical management of the highways, it does not seem necessary to enter at this time. The subject will fall under the local Board, and will, with all the borough expenditure and works, be made the subject of contract. I have only to lament, in common with many of the inhabitants of Penzance, and of other towns that I have visited, that the Act makes no provision for a cheap and sufficient supply of gas. The existence of a corporate body renders it unnecessary that I should trouble you with any remarks upon the proposed constitution of the local Board.

127. SUMMARY.—Looking back over the various points embraced in my inquiry, it appears to me—

1. That being naturally in a remarkably healthy position, the sickness and mortality in Penzance has been excessive, especially from dysentery.

2. That this disease has chiefly prevailed in such parts of the town as are close, damp, and undrained; nor, looking to the circumstances of the population, does it appear that it can be attributed to any other causes.

3. That the supply of water at present given to the town is very insufficient, and that expenses in labour and in money are

incurred, especially by the poor, in obtaining even the moderate quantity used by them.

3. That a large portion of the town is very insufficiently provided with necessaries, and that these, when present, are connected with foul open cesspools and gutter-drains, and in a condition injurious to health and comfort. These necessaries also are generally in exposed places, nor in any case is there a distinction between the sexes in their use.

4. That a sufficient supply of pure soft water, at a natural pressure commanding the whole town, may be laid on in each house, and that each house may be drained, and a complete system of branch and main sewage laid down at a charge amounting to one penny per week upon the lowest class of houses.

5. That these remedies, by reducing sickness and saving labour, will be in reduction of existing charges.

6. That the employment of the sewage in agriculture as manure, for which no credit is taken in the estimate, will probably be extensive; that it may be supplied economically, and, from the character of the suburban lands, may be regarded safely as a source of profit.

I have the honour to be,

My Lords and Gentlemen,

Your most obedient servant,

GEO. T. CLARK,

Superintending Inspector.

LONDON :

Printed by WILLIAM CLOWES and Sons, Stamford Street.
For Her Majesty's Stationery Office.

